



## The effects of mycofloral infection on the viability and ultrastructure of wet-stored recalcitrant seeds of *Avicennia marina* (Forssk.) Vierh.

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### Abstract

Three questions are considered in the context of the possible effects of seed-associated mycoflora, typified by *Fusarium moniliforme*, during hydrated storage of recalcitrant propagules of the tropical species, *Avicennia marina*. These pertain to storage lifespan, whether seed susceptibility to fungal attack changes and the possibility of discriminating ultrastructurally between inherent deteriorative changes and those that are fungally-induced. The data indicate unequivocally that if fungal activity is curtailed, then the hydrated storage lifespan of *A. marina* seeds can be considerably heightened. When inoculated immediately with *F. moniliforme*, newly harvested seeds were extremely susceptible to the adverse effects of the fungus, while seeds that had been wet-stored for 4 d showed a considerably heightened resilience to the effects of the fungus when inoculated at that stage. The enhanced resilience, although declining, persisted in seeds stored hydrated for up to 10 d prior to inoculation, being lost after 12 d. After 14 d of hydrated storage, seeds became more susceptible to the effects of the fungus than those in the newly harvested condition. The resilience of seeds that had been stored in the short-term was associated with ultrastructural changes indicative of enhanced metabolic activity associated with the onset of germination. However, with the sustained stress imposed by wet-storage conditions, the seeds became increasingly badly affected by the fungus. While it was not possible to discriminate with certainty among deteriorative subcellular events ascribable to inherent deterioration or the effects of the fungus, it is concluded that a comparison of the timing of

the onset of degeneration may well be diagnostic of its cause.

**Keywords:** *Avicennia marina*, deterioration, hydrated storage, mycoflora, recalcitrant seeds, survival, ultrastructure

### Introduction

Although mycofloral infection of orthodox seeds has been extensively studied, there have been few data published on the impact of microflora, especially fungi, on the curtailed storage life of recalcitrant seeds.

Depending on the species, hydrated, intact recalcitrant seeds can be stored only for days to months (Chin and Roberts, 1980; Berjak, 1996; Berjak *et al.*, 1989; Pammenter *et al.*, 1997). However, the conditions necessary to maintain the viability of stored, tropical, recalcitrant seeds (high humidity and relatively high temperatures) are also conducive to fungal and bacterial proliferation (Berjak, 1996).

Recalcitrant seeds, like their orthodox counterparts, generally harbour a range of fungi and bacteria even when they have been newly hand-harvested (Mycock and Berjak, 1990; our unpublished data). More than 20 fungal species can be harboured by the seeds of *Hevea brasiliensis* in Malaysia (Dalbir-Singh and Singh, 1990). The highly recalcitrant seeds of *Avicennia marina*, a tropical mangrove, can be infected by species of *Aspergillus*, *Penicillium* and *Fusarium*, as well as by bacteria which persist to a lesser or greater extent during storage (Mycock and Berjak, 1990; our unpublished data). Fungi cause a recognised problem in recalcitrant seeds of cold temperature origin as well (Murray, 1974; Delatour, 1978). The composition of the associated mycoflora on, and in, recalcitrant seeds of

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